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**MAPPING BUILT ENVIRONMENT PROFESSIONALS' EDUCATIONAL NEEDS TO INTERNATIONAL POLICY FRAMEWORKS FOR DISASTER RISK REDUCTION – COMMUNITY STAKEHOLDER PERSPECTIVE**

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MAPPING BUILT ENVIRONMENT PROFESSIONALS’ EDUCATIONAL NEEDS  
TO INTERNATIONAL POLICY FRAMEWORKS FOR DISASTER RISK  
REDUCTION – COMMUNITY STAKEHOLDER PERSPECTIVE

Abstract

**Purpose** – Disaster risk reduction is prominent in the international policy agenda and the year 2015 brought together three international policy frameworks which contribute to disaster risk reduction (i.e. the Sendai framework for disaster risk reduction, the sustainable development goals, and Paris climate change agreement – COP21). However, there is a dearth of effort at identifying and aligning the specific educational needs of built environment professionals with the three policy frameworks. This is needed to facilitate the incorporation of the contents of the policy frameworks into built environment professionals’ training. Therefore, this study maps the educational needs of built environment professionals with the core areas of the three international policy frameworks.

**Design/methodology/approach** – This study utilised CADRE (Collaborative Action towards Disaster Resilience Education) research project outcomes alongside the earlier mentioned three international policy frameworks. A comprehensive desk review was done to map the educational needs identified in the CADRE project with the core priority areas of the three policy frameworks.

**Findings** –The study revealed the educational needs that are significant towards an effective implementation of the core priority areas of the three international policy frameworks.

**Practical implications** – This study would be beneficial to the built environment professionals involved in disaster risk reduction. They will be aware of the specific knowledge areas that would aid the successful implementation of the aforementioned three international policy frameworks.

**Originality/value** – The outcomes of the study would be beneficial to higher education providers in disaster risk reduction and sustainable development. It has identified the knowledge and competency gaps needed to be bridged in the curricula in order to meet the demands created by the international policy frameworks.

**Keywords:** Built environment, disaster resilience, disaster risk reduction, policy frameworks, professionals

**Paper type** Research paper

1. INTRODUCTION

Since the adoption of the Hyogo Framework for Action (HFA) in 2005, progress has been made in reducing disaster risk at local, national, regional and global levels (UNISDR, 2015a). This progress is evident in the decrease in mortality rate from hazards (UNISDR, 2015a). However, although there has been progress, disasters have continued to exact a heavy toll on

people, properties, communities and countries. For instance, the January 2010 earthquake in Haiti, the earthquake in New Zealand in September 2010 and February 2011, the July 2010 floods in Pakistan and in Australia in December 2010 among other catastrophes resulted in heavy toll (UNISDR, 2011). This is affirmed by the Emergency Events Database (EM-DAT) (2016), it recorded that in 2015, 346 disasters were reported and 22,773 people died, about 98.6 million people were affected with a US\$66.5 billion economic damage. Thus, 10 years after the adoption of the HFA (2005 – 2015), the magnitude of loss from disasters remains significant and this is a threat to sustainable development. Notwithstanding, the HFA has provided a critical guidance for disaster risk reduction efforts (UNISDR, 2015a).

The implementation of HFA has also revealed some gaps in tackling disaster risk factors, formulation of goals and drafting priorities, promoting disaster resilience at all levels, and effective implementation (UNISDR, 2015a). These gaps emphasise the need for a development on Hyogo framework, the new framework should help identify disaster risks, guide investments in disaster resilience and as well bridge all other gaps (UNISDR, 2015a). Towards bridging these gaps and addressing other related issues, the Sendai framework for disaster risk reduction (2015 – 2030) was developed. The Sendai framework was endorsed in March 2015 by the UN General Assembly in Sendai City, Japan, it is the first major post-2015 disaster risk reduction agreement (UNISDR, 2015). The framework is directed at reducing disaster risk across multiple sectors. By adopting the Sendai framework, a substantial reduction is expected in disaster risk and loss of lives, livelihood, as well as all other social, economic, physical, cultural and environmental impacts of disasters (UNISDR, 2015).

Sendai framework highlighted the importance of incorporating disaster risk knowledge in all forms of education and training, including civic education at all levels (UNISDR, 2015a). Similar to the Sendai framework (2015-2030) are the United Nations Framework Convention on Climate Change Agreement 2015 (Paris Climate Change Agreement – COP21) and the United Nations Sustainable Development Goals 2015. The frameworks were born out of the need for an action-oriented framework for managing disaster risks and promoting sustainable development (UNISDR, 2015; UNDESA, 2015). Thus, there is urgent need to leverage the understanding of disaster risk reduction and sustainable development in all its dimensions among the stakeholders working towards enhancing disaster resilience and sustainable development.

In the light of the above, the research community including professional bodies and international organisations were triggered to identify the key roles and responsibilities of the built environment professionals in disaster management (Max Lock Centre 2009; Amaratunga, 2014; Witt et al., 2014). Earlier researchers have also identified the skills that built environment professionals could contribute to disaster resilience (Bosher *et al.*, 2007; Thayaparan et al., 2010; Siriwardena et al., 2013; Perera *et al.*, 2015; Thayaparan et al., 2015). Others advocated for the education of built environment professionals and proactive multi-stakeholder approach that involves construction professionals in their studies (Bosher, 2009 and Gencer, 2013) However, there is a dearth of effort at identifying and aligning the specific educational needs of built environment professionals with the three international policy frameworks. This is needed to facilitate the incorporation of the contents of the policy frameworks into built environment professionals' educational needs. As a result, this study was guided by the following objectives: identify the educational needs of the built environment professionals serving disaster-affected communities; and map the identified educational needs with the core areas of international policy frameworks for disaster risk reduction and sustainable development. In this study, the term 'educational needs' refer to the key built environment professionals' knowledge areas needed to be utilised in the context of natural disasters. The list of educational needs in Table 1 is the summary of the general submissions of the community stakeholder group.

The community group is one of the key stakeholder groups relevant to the disaster resilience theme; others are the private sector, local and national governments, non-governmental organisations (NGOs) and international agencies, and academic and research organisations. According to Twigg (2009) 'in conventional emergency management, communities are viewed in spatial terms: groups of people living in the same area or close to the same risks'. The definition above is adequate for this research but it is acknowledged that a community can be described based on interests, occupation, and religious inclination, these are excluded in the definition above. Ideally, the people exposed to disaster risks should be involved in risk reduction and disaster resilience efforts; the community should hugely contribute to all social wellbeing and capacity development efforts (Sastry, 2001, p. 2 cited in (Hossain, 2013). This submission underlines the importance of presenting community's perspective on the educational needs of built environment professionals in the light of international policy frameworks on disaster risk reduction and sustainable development. It should also be noted that all other stakeholders belong to one community or the other.

The findings of this study would guide the built environment professionals on what is needed to upgrade their capacity in line with the priority areas of the Sendai framework 2015 – 2030, Climate change agreement 2015 (Paris Agreement – COP21) and the United Nations Sustainable Development Goals 2015. Similarly, the study findings will be useful for non-governmental organisations (NGOs), governments: national, regional and local, and the private sector in drawing policy recommendations as well as monitoring and assessing the skills required by built environment professionals for an effective implementation of the international policy frameworks. This study will also be a valuable addition to studies that have called for capacity enhancement for disaster risk reduction in the built environment such as Ginige, Amaratunga and Haigh (2010).

## **2. INTERNATIONAL POLICY FRAMEWORKS FOR DISASTER RISK REDUCTION**

Disaster risk reduction, disaster resilience and sustainable development are prominent in international policy agenda and the year 2015 brought together three international policy frameworks relating to disaster risk reduction and sustainable development (i.e. the Sendai framework for disaster risk reduction, the sustainable development goals, and the Paris climate change agreements 2015 – COP21). Therefore, it becomes imperative to understand these frameworks and thereafter consider how they can be effectively implemented. It is on this premise that Hyogo framework for action 2005 – 2015 and the three aforementioned policy frameworks introduced in 2015 are briefly discussed as follows:

### **2.1 Hyogo Framework for Action (HFA) 2005–2015**

In January 2005, the 168 member states of the United Nations adopted the Hyogo Framework for Action (HFA) 2005–2015 at the World Conference on Disaster Reduction in Kobe, Japan (UNISDR, 2007), it was an ambitious effort to reduce all forms of losses from disasters. The HFA's expected outcomes, strategic goals, and priorities were meant to guide disaster risk reduction efforts from 2005 to 2015 (UNISDR, 2009). From the accounts of UNISDR (2011), the HFA strengthened and actually guided international cooperation efforts, aided the generation of necessary political momentum for disaster risk reduction and stood as a solid foundation for national and international development agendas. It was credited to have given a common language and a blueprint of critical actions to governments (UNISDR, 2011). As a

result, since 2005, substantial progress has been made in raising the profile of disaster risk reduction across the globe (UNISDR, 2011).

It was indicated in the HFA that its implementation “will be appropriately reviewed”, the United Nations International Strategy for Disaster Reduction (UNISDR) was tasked to “prepare periodic reviews on progress towards achieving HFA’s objectives and priorities” (UNISDR, 2011). As a result, the HFA implementation was monitored, particularly by the World Bank and the UNISDR via a stakeholder participatory approach at national, regional, and international levels. Progress was monitored and the challenges remaining in the implementation of the HFA were identified. The findings made include, the HFA goals that were yet to be achieved, necessary inclusions in future disaster risk reduction frameworks, suggested improvements on the HFA and some other findings that were utilised in the Post-2015 framework for disaster risk reduction, which is Sendai framework.

**2.2 The Sendai Framework 2015-2030**

As mentioned in the introduction, the Sendai framework was endorsed in March 2015 by the UN General Assembly. The Sendai framework is a development on the Hyogo Framework for Action, it was developed to build on and ensure continuity with the progress made by stakeholders on disaster risk reduction during the implementation of the Hyogo Framework for Action and other documents such as the International Strategy for Disaster Reduction of 1999, the Yokohama Strategy for a Safer World of 1994, and the International Framework of Action for the International Decade for Natural Disaster Reduction of 1989 (UNISDR, 2015b). The Sendai framework aims to ensure a risk-informed and disaster resilient future (COP21, 2015). The framework address climate change and climate actions, it provides measures, guiding principles, and suggests implementation approach. In a submission, COP21 (2015) stated that the Sendai framework highlighted the need to ensure credible links between climate change, disaster risk reduction, the sustainable development goals, development financing, and improved coherence of policies, collaboration among institutions, reporting methodologies and performance measurement. Sendai framework has seven targets and four priorities for action which are directly connected to a goal and an expected outcome (UNISDR, 2015). The priorities for action of Sendai framework are “understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response, and to build back better in recovery, rehabilitation and reconstruction”



(UNISDR, 2015). Each of the four priorities for action have sub-actions divided into local and national levels, and regional and global levels. Each of the main and sub actions relevant to the built environment professionals were studied, interpreted and labelled for use in this study (see Section 3 and the legend accompanying Table 3). The Sendai framework is expected to guide all disaster risk reduction activities at all levels of governance within a 15-year period, the framework is to be implemented under thirteen (13) guiding principles (UNISDR, 2015). Summarily, the Sendai framework aims to achieve the following outcome from 2015 – 2030:

“The substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities, and countries” (UNISDR, 2015a).

### **2.3 Paris Climate Change Agreement 2015 (COP21)**

The COP 21 which is a parent treaty of the 1997 Kyoto Protocol was born out of the need to achieve resilient and sustainable development, the agreement targets the strengthening of the ability of stakeholders to tackle the impacts of climate change (UNFCCC, 2015). The COP21 was agreed to by 195 nations in December 2015, the agreement allows the implementation of its contents in line with national and global objectives towards reducing emission and strengthen resilience (UNFCCC, 2015; United Nations 2015). The COP21 covers core areas referred to as landmark essentials or crucial areas, the areas are mitigation, transparency and global stock-taking, adaptation, loss and damage (recovery from climate impacts) and supports for achieving clean and resilient world (UNFCCC, 2015; United Nations, 2015). The COP21 largely recognise the importance of businesses, investors, other private sector players, cities and regions to the achievement of a low-carbon, sustainable and resilient future (UNFCCC, 2015). The stocktaking aimed at evaluating countries' progress towards the goal of the agreement is scheduled to start in 2023 even as activities are monitored by a compliance team of experts (UNFCCC, 2015). The crucial areas include mitigation i.e. reduction of emission towards achieving the agreed targets and temperature goals, transparency of action, system and support, adaptation i.e. strengthening of stakeholders' ability to deal with or manage climate impacts, loss and damage i.e. loss from climate impact, risk transfer and the strengthening of recovery abilities, finance i.e. provision of financial resources and supports to build a clean, sustainable and disaster resilient future and four other



crucial areas (UNFCCC, 2015; United Nations, 2015). The nine landmark essentials or crucial areas are outlined and briefly described in the legend that accompanies Table 3.

It is important to note that achieving the landmark essentials outlined by the agreement requires the contributions of several stakeholders in the respective nations and globally. The specific recognition of the importance of businesses, investors, cities and regions is commendable. The place of the built environment in sustainable development and disaster resilient future cannot be overemphasised (UNDP, 2013), it should be recalled that the term ‘built environment’ describes the products of human building activities, it includes all physical alteration to the natural environment (Lawrence and Low, 1990). As a result, achieving a sustainable and disaster resilient future requires significant appropriate contribution from the built environment professionals (Haigh and Amaratunga, 2010; Thayaparan et al., 2010; Siriwardena et al., 2013; Perera *et al.*, 2015; Thayaparan et al., 2015).

**2.4 Sustainable Development Goals**

The Sustainable Development Goals(SDG) is the product of a United Nations summit held in 2015, the SDG for the agenda 2030 has 17 goals (United Nations, 2016). A platform was launched to seek partnership and initiatives aimed at supporting the newly adopted SDG, the platform recorded about 1800 partnerships and 40 initiatives (UNDESA, 2015). The call for partnership and initiatives that focus on advancing sustainable development underlines the importance of the need for all stakeholders to support and embed the relevant part of the goals in their activities, actions and services. UNDESA (2015) presented examples of initiatives aimed at promoting the sustainable development goals. The sustainable development goals include among others “ensure availability and sustainable management of water and sanitation for all, ensure access to affordable, reliable, sustainable and modern energy for all, build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” (UNDESA, 2015). Each of the goals also have sub goals, all the main and sub-goals were reviewed, labelled and utilised in the mapping exercise done to achieve the aim of this study. The process and the outcome are presented in section 3, section 4 and Table 4. Presented in the next section is the research methodology for this study.

**3. RESEARCH METHODOLOGY**

Creswell (2013) described research design as the research process; it consists of the plans and procedures, data collection methods and the method of analysis adopted in a research. This research is a qualitative study, the word qualitative refers to the attributes of entities, processes, and meanings that are not experimentally measured (Denzin & Lincoln, 2008). Qualitative research is interpretive, naturalistic, and qualitative researchers objectively interpret a phenomenon of interest based on valid accounts (Denzin & Lincoln, 2008). A number of methods were adopted in this study, this includes semi-structured interviews, desk review, and a mapping exercise. A semi-structured interview does not limit the depth of probe of an interviewer but rather prevents the interviewee from roving or digressing excessively (Flick, 2014). Creswell (2013) submitted that researchers purposively select participants, therefore, a large number of participants or cases are not actually required in an interview-based research. Thus, a total of fifteen semi-structured interviews were conducted with carefully selected respondents from the “community” stakeholder group across different locations.

Each of the respondents have either experienced disaster events as a member of a disaster-affected community or have been deeply involved in the recovery and reconstruction of disaster-affected communities. The selection criteria were necessary to ensure that only the respondents with valid information were engaged. The selection approach is consistent with judgement sampling (Sekaran, 1992). The interview focused on the needs of communities and the skills required from construction industry professionals to meet the needs while serving communities in the context of disasters. The semi-structured questions used during the interviews served as a guide and a good check for the discussion. The data gathered were analysed using thematic coding (Flick, 2014), the themes that emerged from the interviews were collated and similar themes were merged. Eventually, twenty-nine educational needs (i.e. knowledge gaps) were identified (Table 1), this aspect of the study is reported in more details in Perera *et al.* (2017) (Part of CADRE research outputs).

This research progressed with a comprehensive desk review involving four researchers and academics in the built environment. The review was carried out on Sendai framework, the sustainable development goals and the Paris Climate Change Agreement (COP21). The review resulted in the identification of areas relevant to the built environment professionals in all the policy frameworks. In the Sendai framework, the priorities for action and guiding principles were read, interpreted and labelled (See the legend under Table 2). Also, the nine

crucial areas outlined in the Paris Climate Change Agreement (COP21) (See the legend under Table 3), and the 17 goals in the Sustainable Development Goals were read, interpreted and labelled (See the legend under Table 4). The labels served as references for each of the items during the mapping exercise that followed.

The mapping process involved the alignment of the priorities for action and guiding principles (see the Sendai framework), crucial areas (see the COP21), and goals (see the Sustainable Development Goals) with the identified educational needs (Table 1). This mapping approach was employed by Macgillivray *et al.* (2007), the study abstracted core principles from maturity literature, aligned and tailored it to risk management for benchmarking and maturity improvement purpose. Similarly, Udeaja *et al* (2015) qualitatively mapped sustainability-related features within Quantity Surveying (QS) degree programmes curriculum, to identify sustainability-related educational needs within the curriculum. The qualitative mapping method was also utilized by Perera *et al* (2016) to produce a framework for regulating professionally oriented higher degree programmes. Sarshar *et al.* (2000) submitted that the qualitative mapping exercise is tedious. However, the method has been successfully adopted for various purposes in previous studies. It was used in the study to identify the educational needs of built environment professionals in the context of disaster risk reduction, disaster resilience and sustainable development. Presented in the next section is the outcome of the identification of the educational needs and the mapping exercise.

4. RESULTS AND DISCUSSION

Table 1 reveals the identified 29 educational needs with the respective sample components, the educational needs are the consolidated themes from the interview. Among the educational needs that were identified to be important for built environment professionals and perhaps not the core of their trainings are qualitative leadership and people management, supply chain management, team working, multi-stakeholder management, communication and negotiation/information systems, business planning, and governance. The study finding affirmed some existing literature, particularly Jo da Silva, Lubkowski, Batchelor, and Kabir (2010) that described post-disaster reconstruction or recovery as a complex process, it requires a range of skills, multi-sectoral involvement, and consumes huge resources. This claim is underscored by the number of times that issues relating to community participation and mobilization, use of local skills and local knowledge, empowering and engaging

[illegible]

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### Legend

GPa - GPm: Sendai framework guiding principle a to m

PA1NLa – PA1NLo: Priority for Action 1 at National & local levels (sub actions a too)

PA2NLa – PA2NLk: Sendai framework priority for action 2 – National & local levels

PA3NLa – PA3NLq: Sendai framework priority for action 3 – National & local levels

PA4NLa – PA4NLp: Sendai framework priority for action 4 – National & local levels

For example, 'PA1NLa' reads priority action 1, national and local level, sub action 'a'

Presented in Table 3 is the mapping of the identified educational needs with the Paris

**Legend:**

CA1 – Mitigation – reduction of emission towards achieving the agreed targets and temperature goals

## CA2 – Transparency of action, system and support

CA3 – Adaptation – this refers to the strengthening of stakeholders' ability to deal with or manage climate impacts

CA4 – Loss and damage – this refers to the loss from climate impact, risk transfer and the strengthening of recovery abilities

CA5 – Finance – Provision of financial resources and supports to build a clean, sustainable and disaster resilient future.

CA6 – Technology Development and Transfer – needs assessment, research and technological support

CA7 – Capacity building – Capacity enhancement supports, address gaps, enhance synergy, dialogue, coordination, collaboration

CA8 – Global stocktake – stocktaking and accountability

CA9 – Facilitating implementation and compliance – modalities and procedures for effective operation to build a clean, sustainable and disaster resilient future.

Presented in Table 4 is the mapping of the identified educational needs with the Sustainable Development Goals. After a thorough desk review of the sustainable development goals, it was discovered that only six of the 17 goals can be directly linked with the built environment professionals. Thus, only the six goals were mapped with the needs. The mapping presented in Table 4 is also based on the interpretation of each of the goals and the meaning of the identified educational needs. This shows how the identified educational needs can be utilised by built environment professionals for the accomplishment of these goals.

Insert Table 4

### Legend

- G6/6.1 – G6/6.6: Goal 6, Ensure availability and sustainable management of water and sanitation for all, sub-goal 1-6
- G7/7.1 – G7/7.3: Goal 7, Ensure access to affordable, reliable, sustainable and modern energy for all, sub-goals 1-3
- G9/9.1 – G9/9.5: Goal 9, Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, sub-goals 1-5
- G11/11.1 – G11/11.7: Goal 11, Make cities and human settlements inclusive, safe, resilient and sustainable, sub-goals 1-7
- G13/13.1 – G13/13.3: Goal 13, Take urgent action to combat climate change and its impacts, sub-goals 1-3
- G17/17.1 – G17/17.19: Goal 17, Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development, sub-goals 1-19

It is interesting to note that some previous studies examined a variety of topics in relation to policy frameworks. For instance, Kelman (2015) reviewed how climate change is mentioned in the Sendai framework, Aitsi-Selmi et al (2015) reviewed the development process that led to Sendai framework with a focus on people's resilience, health, and well-being, Stough and Kang 2015 evaluated the Sendai framework with a focus on persons with disability. Similarly, this study has analysed the educational needs of built environment professionals in the context of disasters and sustainable development policy frameworks. The need for an action oriented framework led to the development of the policy frameworks (UNISDR, 2015). This study has gone further to reveal how built environment professionals could aid the implementation and performance of the action oriented frameworks. The study has provided a voice for the community stakeholder group whose needs often get ignored when policies are made from the top. Basically, a link has been drawn between the policy types and levels and the educational needs of the built environment professionals as outlined by the community stakeholder group (See Tables 2, 3 and 4 and associated legends). This is expected to aid the service delivery of professionals in disaster affected communities. The study has also revealed a high magnitude of entrenchment of built environment related issues



in the policy frameworks. Clearly, the built environment professionals' educational needs and their links with the policy frameworks have been greatly established in this study.

**5. CONCLUSION**

The Sendai framework emphasised the importance of all forms of education and training i.e. formal and non-formal education, civic education, as well as professional education and training at all levels in reducing disaster risk (UNISDR, 2015). The need to clearly understand the educational needs required for the implementation and adequate entrenchment of the Sendai framework and other international policy frameworks in educational curricula cannot be overemphasised. Thus, this study identified 29 educational needs of the built environment professionals serving disaster affected communities and mapped the needs with the core priority areas of Sendai framework, the Sustainable Development Goals, and the Paris Climate Change Agreement (COP 21). All the needs were directly mapped to the policy frameworks except for one (out of 29) that could not be mapped with any priorities for action in the Sendai framework.

This study has presented the educational needs that are significant towards the effective implementation of the four core priorities of Sendai framework on the respective areas of priorities for actions at the Global & Regional level and National & Local levels. This was also done for the two other international policy frameworks considered in this study. The findings of the study affirmed the existing literature such as Jo da Silva *et al.* (2010) that described post-disaster reconstruction or recovery as a complex and resource consuming process. The study revealed that team working, budgeting & financial planning, quality leadership & people management, communication & negotiation/information systems, insurance, project audit & reporting, business planning, multi-stakeholder management, among others are knowledge areas that built environment professionals could bring to leverage the disaster management and the sustainable development process. These skills were requested to be entrenched further in the trainings of built environment professionals, especially in the context of disaster risk reduction.

The study would be beneficial to the built environment professionals involved in disaster risk reduction. The professionals will be aware of the specific knowledge areas required to successfully implement the three international policy frameworks and therefore improve their capability accordingly. In addition, the findings of the study would be highly beneficial to



higher education providers in disaster risk reduction and sustainable development. It has identified the specific knowledge and competency gaps needed to be bridged in the curricula to meet the demands created by the international policy frameworks. This study is part of CADRE EU research that aims to develop a professional doctorate programme crafted on clear demands, needs, knowledge gaps with adequate input from communities and other stakeholders in the society.

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Table 1: Descriptions of the identified educational needs with the sample portion of their components

|   |  |  |
|---|--|--|
| <b>1. Budgeting &amp; financial planning</b><br>- Fund sourcing and financial management skills<br>-Funding or financing to address disaster resilience<br>-Financing flood adaptation strategies | <b>10. Quality leadership &amp; people management</b><br>-Objective consideration of issues- Flexibility<br>-Understanding the community needs<br>-Leadership skills | <b>19. Communication &amp; negotiation/Information systems</b><br>- Language (familiarity with local language) and communication skills<br>- Effective communication links<br>- Negotiation skills |
| <b>2. Quantification &amp; costing of construction works</b><br>-Budgeting and estimating construction costs<br>-Pricing and estimating-Construction works  | <b>11. Team working</b><br>-Effective use of community groups & individuals<br>-Engaging community<br>- Relationship with other agencies and communities             | <b>20. Project audit &amp; reporting</b><br>- Knowledge of loss assessment and loss adjustment<br>- Auditing skills  |
| <b>3. Supply chain management</b><br>-Alternative utility supplies after disaster   | <b>12. Governance</b><br>-Transparency and accountability in adopted processes<br>- Minimising political interferences   | <b>21. Conflict management &amp; dispute resolution procedures</b><br>- Knowledge of dispute resolution  |
| <b>4. Consultancy services</b><br>-Assistance from external parties (i.e. government; NGOs; Private sector, etc.)<br>-Providing property advice to community                                      | <b>13. Multi-stakeholder management</b><br>- Clarity on roles and responsibilities of different parties<br>- Multi-stakeholder engagement                            | <b>22. Cross-cultural awareness in global resilience</b><br>- Familiarity with local language<br>- Use of local skills and local knowledge   |

|  |  |  |
|--|--|--|
| <b>5. Procurement &amp; contract administration/practice</b><br>-Advice to community on selection of contractors and consultants<br>-Selection of consultants and contractors - pre-qualifications | <b>14. Business planning</b><br>- Temporary business area<br>- Business continuity strategies/plans<br>- Business protection<br>- Needs assessment and prioritisation of resources | <b>23. Project management</b><br>- Project management skills   |
| <b>6. Building regulation &amp; planning</b><br>-Resilience planning, designing and construction<br>-Knowledge on land-use planning  | <b>15. Environmental assessment</b><br>- Weather changes monitoring<br>- Awareness of potential disaster threats<br>- Forecasting and warnings                                     | <b>24. Asset/Resource management</b><br>-Use of local skills and resources<br>- Prioritisation of resources            |
| <b>7. Legal/Regulatory compliance</b><br>-Knowledge of prevailing laws needs for the flexibility of laws and policies  | <b>16. Management of the built environment</b><br>- Development of preventive structures and methods   | <b>25. Disaster management</b><br>- Management of disaster relief  |
| <b>8. Health &amp; safety</b><br>-Temporary housing provision<br>-Availability and identification of suitable alternative place to relocate  | <b>17. Insurance</b><br>- Financial compensation for damages<br>- Knowledge and awareness of insurance<br>- Property insurance<br>- Adequacy of insurance cover                    | <b>26. Risk management</b><br>- Disaster risk assessments  |
| <b>9. Work progress &amp; quality management</b><br>-Rapid restoration of damaged infrastructure<br>-Better infrastructure needs   | <b>18. Time management</b><br>- Time management  | <b>27. Continuing professional development</b><br>-Awareness & education on disaster resilience                        |
|  |  | <b>28. Emergency management</b><br>- Rapid recovery after an onset of a disaster<br>- Management of emergency shelters |
|  |  | <b>29. Construction technology &amp; environmental services</b><br>- Knowledge on resilient construction practices     |

Table 2: Mapping of the identified educational needs with the Sendai framework

| No. | Identified educational needs                   | Sendai framework   |                            |                         |
|-----|--|--|----------------------------|-------------------------|
|     |  | Priorities for action (PA)<br>(With details)   | Priorities for action (PA) | Guiding principles (GP) |
| 1   | Budgeting & financial planning                 | PA1NLk, PA2NLc, PA3NLm   | PA1, PA2, PA3              | GPj, Gpm                |
| 2   | Quantification & costing of construction works | PA3NLc   | PA3                        | GPj                     |
| 3   | Supply chain management                        | PA4NLe   | PA4                        |                         |
| 4   | Consultancy services                           | PA4GRg   | PA4                        | GPj, Gpm                |
| 5   | Procurement & contract administration/practice | PA3NLc   | PA3                        |                         |
| 6   | Building regulation & planning                 | PA2NLd, PA3NLf, PA3NLh, PA4NLj, PA4NLk, PA4NLI   | PA1, PA2, PA3, PA4         |                         |
| 7   | Legal/Regulatory compliance                    | PA1NLn, PA2NLa, PA2NLb, PA2NLd, PA2NLf, PA2NLk, PA3NLj, PA4NLa, PA4NLb, PA4NLp   | PA1, PA2, PA3, PA4         | GPa, GPh                |
| 8   | Health & safety                                | PA4NLj, PA4NLo   | PA4                        |                         |
| 9   | Work progress & quality management             | PA3NLc,  | PA3                        | Gpk                     |
| 10  | Quality leadership & people management         | PA2NLc, PA4NLo   | PA2, PA4                   | Gpb, Gpd                |
| 11  | Team working                                   | PA1NLh, PA1NLo, PA1GRc, PA2NLf, PA2NLh, PA2GRa, PA2GRb, PA2GRc, PA2GRd, PA2GRc, PA2GRf, PA3GRc, PA3GRf, PA4GRa, PA4GRf | PA1, PA2, PA3, PA4         | GPa, Gpd, GPe, GPf      |
| 12  | Governance                                     | PA2NLa, PA3GRg   | PA2, PA3                   | GPa, GPb                |
| 13  | Multi-stakeholder management                   | PA1GRa, PA1GRg, PA2NLg, PA2NLI, PA2GRa, PA2GRb, PA2GRc, PA2GRd, PA2GRE, PA3GRd, PA4NLI, PA4NLI, PA4GRa, PA4GRf         | PA1, PA2, PA3, PA4         | GPa, GPe, GPI           |
| 14  | Business planning                              | PA3NLo, PA3GRi, PA4NLg,  | PA3, PA4                   |                         |
| 15  | Environmental assessment                       | PA3NLg, PA4NLb   | PA3, PA4                   |                         |
| 16  | Management of the built environment            | PA3NLn, PA3GRa   | PA3                        | Gpc                     |
| 17  | Insurance                                      | PA3NLb, PA3GRb   | PA3                        |                         |
| 18  | Time management                                | Relevant to all  |                            | Gpm                     |

| No. | Identified educational needs                        | Sendai framework   |                            |                         |
|-----|---|--|----------------------------|-------------------------|
|     |   | Priorities for action (PA)<br>(With details)   | Priorities for action (PA) | Guiding principles (GP) |
| 19  | Communication & negotiation/Information systems     | PA1NLa, PA1NLc, PA1NLe, PA1NLf, PA1GRa, PA1GRc, PA1GRg, PA1GRh, PA1GRi, PA2GRf, PA4NLb, PA4GRb, PA4GRd | PA1, PA2, PA4              | GPg, GPm                |
| 20  | Project audit & reporting                           | PA2NLc   | PA2                        |                         |
| 21  | Conflict management & dispute resolution procedures |  |                            |                         |
| 22  | Cross cultural awareness in global resilience       | PA1NLc, PA1NLI, PA1NLo, PA3NLd   | PA1, PA3                   | GPa, GPi, GPm           |
| 23  | Project management                                  | Relevant to all  |                            |                         |
| 24  | Asset/Resource management                           | PA3NLa, PA3NLn, PA3NLp, PA3NLq, PA3GRf   | P3                         | GPc, GPm                |
| 25  | Disaster management                                 | PA4NLh   | PA4                        |                         |
| 26  | Risk management                                     | PA1NLb, PA1NLaj, PA1GRb, PA1GRg, PA2GRf  | PA1, PA2                   | GPa, GPc, GPI           |
| 27  | Continuing professional development                 | PA1NLg, PA1NLI, PA1NLm, PA1GRc, PA1GRf, PA1GRg, PA1GRi, PA2NLj, PA4NLm, PA4GRf                         | PA1, PA2, PA4              | GPk, GPm                |
| 28  | Emergency management                                | PA4NLd, PA4NLm   | PA4                        |                         |
| 29  | Construction technology & environmental services    | PA1NLj, PA2NLc, PA3NLc, PA3NLc, PA3GRc, PA4NLc, PA4NLk   | PA1, PA2, PA3, PA4         | GPk, GPm                |

Table 3: Mapping of the identified educational needs with the Paris Climate Change Agreement (COP21)

| No. | Identified educational needs                        | Paris Climate Change Agreement (COP21) |
|-----|---|--|
|     |   | Crucial Areas                          |
| 1   | Budgeting & financial planning                      | CA2, CA3, CA4, CA5, CA8                |
| 2   | Quantification & costing of construction works      | CA2, CA4, CA5, CA8                     |
| 3   | Supply chain management                             | CA4, CA8, CA9                          |
| 4   | Consultancy services                                | CA7, CA9                               |
| 5   | Procurement & contract administration/practice      | CA2, CA4, CA5                          |
| 6   | Building regulation & planning                      | CA1, CA2, CA3, CA8                     |
| 7   | Legal/Regulatory compliance                         | CA2, CA9                               |
| 8   | Health & safety                                     | CA1, CA3, CA4                          |
| 9   | Work progress & quality management                  | CA2, CA9                               |
| 10  | Quality leadership & people management              | CA2, CA9                               |
| 11  | Team working  | CA2, CA3, CA4, CA8                     |
| 12  | Governance  | CA2, CA3, CA4, CA8, CA9                |
| 13  | Multi-stakeholder management                        | CA2, CA3, CA4, CA9                     |
| 14  | Business planning                                   | CA4, CA5, CA8                          |
| 15  | Environmental assessment                            | CA1                                    |
| 16  | Management of the built environment                 | CA1, CA9                               |
| 17  | Insurance   | CA4, CA5                               |
| 18  | Time management                                     | CA1, CA2, CA3, CA4                     |
| 19  | Communication & negotiation/Information systems     | CA2, CA6                               |
| 20  | Project audit & reporting                           | CA2, CA4, CA5, CA8, CA9                |
| 21  | Conflict management & dispute resolution procedures | CA2                                    |
| 22  | Cross cultural awareness in global resilience       | CA2                                    |
| 23  | Project management                                  | CA2, CA4, CA5                          |
| 24  | Asset/Resource management                           | CA4                                    |
| 25  | Disaster management                                 | CA3, CA4, CA7                          |
| 26  | Risk management                                     | CA3                                    |
| 27  | Continuing professional development                 | CA3, CA4, CA6, CA7                     |
| 28  | Emergency management                                | CA3, CA4, CA9                          |
| 29  | Construction technology & environmental services    | CA1, CA3, CA4, CA6                     |



Table 4: Mapping of the identified educational needs with Sustainable Development Goals

| No. | Identified educational needs                        | Sustainable Development Goals             |
|-----|---|---|
| 1   | Budgeting & financial planning                      | 9.1, 9.4, 11.1, 11.2, 17.3, 17.8          |
| 2   | Quantification & costing of construction works      | 9.1, 9.4, 11.1, 11.2                      |
| 3   | Supply chain management                             | 9.1, 9.4, 11.1, 11.2                      |
| 4   | Consultancy services                                | 9.1, 9.4, 11.1, 11.2                      |
| 5   | Procurement & contract administration/practice      | 7.2, 9.4, 11.1, 11.2                      |
| 6   | Building regulation & planning                      | 9.4, 11.1, 11.3, 11.7, 13.2, 17.13, 17.14 |
| 7   | Legal/Regulatory compliance                         | 9.4, 13.2, 17.4, 17.14, 17.15             |
| 8   | Health & safety                                     | 9.1, 9.4, 11.1, 11.2, 11.6                |
| 9   | Work progress & quality management                  | 9.1, 9.4, 11.1, 17.19                     |
| 10  | Quality leadership & people management              | 9.1, 9.4, 17.1, 17.10, 17.17              |
| 11  | Team working  | 9.1, 17.16, 17.17                         |
| 12  | Governance  | 17.1, 17.2, 17.4, 17.5, 17.6, 17.9        |
| 13  | Multi-stakeholder management                        | 9.1, 17.1, 17.16, 17.17                   |
| 14  | Business planning                                   | 9.3                                       |
| 15  | Environmental assessment                            | 6.1-6.6, 7.3, 9.4, 11.3, 11.6, 11.7       |
| 16  | Management of the built environment                 | 7.1, 7.3, 9.4, 11.3, 13.1                 |
| 17  | Insurance   | 17.3, 17.4                                |
| 18  | Time management                                     | Relevant to all                           |
| 19  | Communication & negotiation/Information systems     | 17.8                                      |
| 20  | Project audit & reporting                           | 9.4                                       |
| 21  | Conflict management & dispute resolution procedures | Not specifically mentioned                |
| 22  | Cross cultural awareness in global resilience       | 9.1, 11.4, 17.9, 17.10, 17.15, 17.18      |
| 23  | Project management                                  | 9.1, 9.4, 11.2, 17.6                      |
| 24  | Asset/Resource management                           | 6.1-6.6, 9.3, 17.1, 17.6                  |
| 25  | Disaster management                                 | 11.5, 13.1                                |
| 26  | Risk management                                     | 11.5                                      |
| 27  | Continuing professional development                 | 9.5, 13.3, 17.7, 17.9, 17.18              |
| 28  | Emergency management                                | 11.5, 13.1                                |
| 29  | Construction technology & environmental services    | 7.2, 7.3, 9.1, 9.4, 11.1, 11.2, 13.1      |